

Prevalence of Risk and Protective Factors Associated with HIV and HCV Infections Among Male High School Students Who Have Sex with Males—Hawai‘i, 2013, 2015, and 2017

Joshua R. Holmes MPH; Heather B. Clayton PhD, MPH; Thaddeus Pham; Alice K. Asher PhD, RN; and Ranjani R. Starr PhD, MPH

Abstract

Human immunodeficiency virus (HIV) and hepatitis C virus (HCV) infections are increasing among young adults, and males who have sex with males (MSM) are at high risk for both infections. Limited Hawai‘i data exists on the extent to which populations, such as MSM, are engaging in behaviors that place them at increased risk for either infection. This analysis quantified the proportion of Hawai‘i public high school students who are MSM and are at risk for HCV and HIV infections. Data from the 2013, 2015, and 2017 Hawai‘i Youth Risk Behavior Surveys (YRBS) were combined (n=16,751) to investigate the prevalence of risk factors associated with HIV and HCV infections (eg, sexual risk behaviors, substance use) and protective factors among MSM public high school students. Among sexually experienced male students (n=3,391), 13.1% were classified as MSM and among these, 40.3% identified as heterosexual despite reporting same-sex sexual contact. Multivariate modeling demonstrated that MSM students are significantly more likely than non-MSM students to engage in behaviors that increase their risk for HIV and HCV infections (composite risk variable; adjusted Prevalence Ratio: 1.40, 95% CI 1.15 – 1.70) and are significantly less likely to have protective factors. Evidence-based prevention strategies for reducing HIV and HCV risk behaviors while improving protective factors among sexual minority youth in Hawai‘i are necessary and must address sexual behavior along with other dimensions of sexual orientation.

Keywords

HIV/AIDS; Hawai‘i; YRBS; Hepatitis C virus; MSM

Abbreviations and Acronyms

HCV: Hepatitis C Virus

HIV: Human Immunodeficiency Virus

MSM: Males who have sex with males

YRBS: Youth Risk Behavior Survey

Introduction

Hepatitis C virus (HCV) infection is increasing among young adults (<30 years) in the United States due to rising injection drug use linked to the opioid epidemic.¹ Young males who have sex with males (MSM) are at a heightened risk for Human immunodeficiency virus (HIV) infection,² and concomitant HCV co-infection.³ Sexual transmission of HCV, even without self-reported exchange of blood between partners during sex, has been noted among MSM co-infected with HIV.⁴ Substance use is associated with HCV and HIV transmission, and sexual minority high school students have a greater prevalence of self-reported substance use behaviors compared to their heterosexual peers.⁵

Between 2011 and 2013 in Hawai‘i, acute HCV diagnoses for young adults under 30 years who inject drugs more than doubled,⁶ and nearly half of new HIV diagnoses between 2010–2015 were among males under 34 years.⁷ This study examines data from

the Hawai‘i Youth Risk Behavior Survey (YRBS) to understand the extent to which young MSM in Hawai‘i engage in behaviors that increase their risk for HCV and HIV infections. This is the first analysis of its kind to look exclusively at male students in Hawai‘i and will provide insight into the demographic profile of MSM students. This study will also compare this population’s reported prevalence of the risk behaviors associated with HIV and HCV infections to that of non-MSM students. Understanding the risk and protective factors of young MSM may inform targeted interventions to decrease risk in this population.

Methods

Youth Risk Behavior Survey

The Hawai‘i YRBS is a biennial cross-sectional school-based survey of 9th–12th grade students who attend public schools. In Hawai‘i, YRBS uses a two-stage cluster sample design to generate representative data on the prevalence of risk behaviors and protective factors among students. In 2015, survey administration in Hawai‘i changed from an active (opt-in) to a passive (opt-out) consent process for students. This analysis combined data from the 2013, 2015, and 2017 Hawai‘i surveys, with overall response rates ranging from 60.0% to 78.0%. Detailed methodology of the YRBS has previously been published.⁸

Statistical Analyses

In this analysis, students were considered to be MSM based on their answers to two questions – one assessing the student’s sex, and the other assessing the sex of the student’s sexual contacts. Students who identified as male and reported sexual contact with only males or both females and males were classified as MSM. Male students who reported sexual contact exclusively with females were classified as males who have sex with only females (ie, non-MSM). The Hawai‘i YRBS questionnaire measures several behaviors associated with increased risk for HCV and HIV infections and some protective factors that may reduce risk.^{1,4,6} These risk factors include drinking alcohol or using drugs before last sexual intercourse among currently sexually active students (those who had sexual intercourse during the three months before the survey); not using a condom during last sexual intercourse among currently sexually active students; currently using alcohol, cigarettes, or marijuana (on at least 1 day during the 30 days before the survey); ever injecting any illegal drug; ever using other illicit drugs (includes methamphetamine, cocaine, ecstasy, heroin, or hallucinogenic drugs); ever using

prescription pain medicine without a doctor's prescription or differently than prescribed (2017 YRBS only); and seriously considering suicide during the 12 months before the survey. The protective factors include having an adult outside of school they could talk to about important things; and having an adult in their school they could talk to about a problem. A composite variable limited to currently sexually active students was created by combining responses to the questions on condom use and ever injection of any illegal drug (ie, HCV/HIV composite risk). Students were considered to be at risk if they had not used a condom during their last sexual intercourse or ever injected any illegal drugs, while students were considered not at risk if they had used a condom during last sexual intercourse and had never injected any illegal drugs.

The three survey cycles included a total of 16,751 high school students. Analyses were restricted to male students with prior sexual contact, resulting in a final analytic sample of 3,391 students. Bivariate analyses compared demographic characteristics (eg, race/ethnicity, sexual identity, and grade) of the sample by MSM status, with significant differences determined by the chi-square test. Students were classified into race/ethnic categories based on criteria established by Hawai'i.⁹

Weighted prevalence estimates and 95% confidence intervals (CI) of risk behaviors and protective factors were calculated by MSM status. Adjusted prevalence ratios (aPR) and corresponding 95% CIs were calculated in separate logistic regression models for each of the risk and protective factors, with the MSM classification (Yes vs No) serving as the independent variable. Model covariates included race/ethnicity and grade. All statistical analyses were conducted using SAS-callable SUDAAN 11.0.1 (RTI International, Research Triangle Park, North Carolina). *P*-values <.05 were considered statistically significant. The Hawai'i State Departments of Health and Education approved this study. Additionally, it received an exempt status from the Hawai'i State Department of Health Institutional Review Board.

Results

Among male students in Hawai'i who reported previous sexual contact, 13.1% were classified as MSM. MSM students were similar to non-MSM in race/ethnicity and grade distribution (Table 1). Of note, 40.3% of MSM students reported their sexual identity as heterosexual.

Population	MSM ^a high school students		Non-MSM ^b high school students		P-value
	No (%)	CI ^c	No (%)	CI ^c	
Total	464 (13.1%)	(11.5,14.9)	2,927 (86.9%)	(85.1,88.5)	
Grade	% ^d		% ^d		
9th	18.1%	(13.0,24.6)	18.9%	(15.8,22.3)	<i>P</i> = .9442
10th	22.6%	(17.2,29.2)	24.0%	(20.0,28.5)	
11th	27.4%	(19.5,37.0)	26.3%	(22.3,30.7)	
12th	31.9%	(24.7,40.1)	30.8%	(27.1,34.8)	
Race/Ethnicity					
White ^e	12.5%	(8.4,18.0)	16.2%	(13.0,20.0)	<i>P</i> = .0833
Asian ^f	37.4%	(30.0,45.4)	32.8%	(29.4,36.4)	
Native Hawaiian and other Pacific Islander ^g	27.2%	(22.1,33.0)	31.5%	(27.8,35.6)	
Other ^h	22.9%	(18.4,28.2)	19.4%	(18.1,20.9)	
Sexual Identity					
Heterosexual (straight)	40.3%	(33.3,47.7)	95.1%	(93.9,96.0)	<i>P</i> < .0001
Gay or lesbian	20.6%	(16.2,25.9)	1.3%	(0.9,2.0)	
Bisexual	29.1%	(21.7,37.8)	2.1%	(1.4,3.1)	
Not Sure	10.0%	(6.3,15.6)	1.6%	(1.1,2.3)	

^aMale high school students who had sexual contact with males or with both males and females.

^bMale high school students who had sexual contact with only females.

^c95% confidence intervals.

^dDue to rounding, column totals might not round up to 100%.

^eNon-Hispanic White.

^fAsian consists of non-Hispanic Filipino, non-Hispanic Japanese, and non-Hispanic Other Asian.

^gNative Hawaiian and Other Pacific Islander consists of non-Hispanic Native Hawaiian/Part Native Hawaiian, and non-Hispanic Other Pacific Islander.

^hOther consists of non-Hispanic American Indian/Alaska Native, non-Hispanic Black, Hispanic/Latino, and Multiple non-Hispanic.

Behavior	MSM ^a high school students		Non-MSM ^b high school students		Adjusted ^c Prevalence Ratios	CI
	%	CI ^d	%	CI		
Drank alcohol or used drugs before last sexual intercourse ^e	42 (28.4%)	(18.4,41.1)	287 (24.4%)	(20.2,29.1)	1.20	(0.74,1.94)
Did not use a condom during last sexual intercourse ^e	71 (58.9%)	(44.3,72.1)	515 (47.2%)	(42.3,52.2)	1.28	(1.00,1.64)
Currently drank alcohol ^f	215 (52.8%)	(43.2,62.2)	1075 (40.7%)	(37.7,43.7)	1.24	(1.02,1.50)
Currently smoked cigarettes ^g	127 (26.9%)	(21.6,33.0)	469 (16.3%)	(14.2,18.5)	1.61	(1.20,2.16)
Currently used marijuana ^h	185 (38.6%)	(30.1,47.9)	1027 (34.1%)	(31.7,36.7)	1.10	(0.88,1.38)
Ever used prescription pain medicine ⁱ	76 (40.0%)	(31.5,49.1)	181 (18.4%)	(13.9,24.0)	2.23	(1.54, 3.23)
Ever injected any illegal drug ^j	86 (19.5%)	(13.9,26.7)	117 (3.5%)	(2.7,4.5)	4.77	(2.98,7.65)
Ever used other illicit drugs ^k	203 (42.8%)	(34.7,51.2)	590 (20.2%)	(17.8,22.9)	1.99	(1.64,2.42)
Seriously considered attempting suicide ^l	126 (28.2%)	(22.0,35.4)	389 (14.2%)	(12.3,16.3)	2.00	(1.58,2.52)
Hepatitis C virus (HCV)/Human Immunodeficiency Virus (HIV) risk composite ^m	86 (68.2%)	(55.5,78.7)	533 (49.3%)	(44.7,53.9)	1.40	(1.15,1.70)
Had an adult outside of school they could talk to about important things	225 (58.7%)	(50.9,66.1)	1915 (73.6%)	(71.0,76.0)	0.80	(0.69,0.92)
Had an adult in their school they could talk to about a problem	205 (53.2%)	(46.1,60.1)	1677 (66%)	(62.7,69.2)	0.80	(0.69,0.92)

^aMale high school students who had sexual contact with males or with both males and females.

^bMale high school students who had sexual contact with only females.

^cAdjusted by grade (ie, 9th, 10th, 11th, or 12th) and race/ethnicity.

^d95% confidence interval.

^eAmong students who had sexual intercourse during the three months before the survey.

^fAt least one drink of alcohol on at least 1 day during the 30 days before the survey.

^gOn at least one day during the 30 days before the survey.

^hOne or more times during the 30 days before the survey.

ⁱSuch as codeine, Vicodin, OxyContin, Hydrocodone, and Percocet without a doctor's prescription or differently than prescribed one or more times during their life. 2017 YRBS only.

^jUsed a needle to inject any illegal drug into their body one or more times during their life.

^kMethamphetamine, cocaine, ecstasy, heroin, or hallucinogenic drugs use one or more times during their life.

^lDuring the 12 months before the survey.

^mUsed a needle to inject any illegal drug into their body one or more times during their life and/or did not use a condom during last sexual intercourse, among students who had sexual intercourse during the three months before the survey.

Compared to non-MSM students, MSM students had a significantly higher prevalence of engaging in several risk behaviors for HCV/HIV infections: current alcohol use (aPR=1.24, 95% CI: 1.02-1.50); current cigarette smoking (1.61, 1.20-2.16); ever injecting any illegal drug (4.77, 2.98-7.65); ever using other illicit drugs (1.99, 1.64-2.42); and seriously considering suicide (2.00, 1.58-2.52) (Table 2). The HCV/HIV composite risk variable was significantly higher among MSM students compared to non-MSM students (1.40, 1.15-1.70). Although limited to the 2017 YRBS, ever misuse of prescription pain medicine was also significantly higher among MSM students compared to non-MSM students (2.23, 1.54-3.23). In terms of protective factors, MSM students were significantly less likely than non-MSM students to have an adult outside of school they could talk to about important things (0.80, 0.69-0.92) and to have an adult in their school they could talk to about a problem (0.80, 0.69-0.92).

Discussion

More than 40% of the MSM students surveyed identified as heterosexual, which emphasizes the need to target other dimensions of sexual orientation, such as sexual behavior and attraction, to successfully identify all students at elevated risk for HCV and HIV infections. Compared to non-MSM students, more MSM students engaged in behaviors that increased their risk for HCV and HIV infections. Of concern, one in five (19.5%) MSM students in Hawai'i reported injecting any illegal drug at least once, nearly six times the prevalence of their non-MSM peers. MSM students also reported higher misuse of prescription pain medicine (40.0%), which may increase their likelihood of future injection drug use.¹⁰ Moreover, MSM students reported higher rates of suicidal ideation and substance use, and lower rates of important protective factors, such as having an adult they could talk to inside or outside of school, than non-MSM students. Additionally, although minority stress experiences

such as discrimination and prejudice were not explored in this analysis, they have been associated with substance use, suicide ideation, and a lack of protective factors in sexual minority youth.¹¹ Much work is needed to address the risks experienced by this group of adolescents and improve the resources available to provide a protective safety net for this population.

Limitations

There are some limitations to this analysis. The YRBS is administered only to youth who attend school, thus is not representative of all persons in this age group. In 2012, Hawai'i had a 4.7% dropout rate in public high schools, which may bias our results.¹² Furthermore, this data is only representative of public high school students, and a significant proportion (15.6%) of students in Hawai'i attended private schools in 2013.^{13,14} Because no definition was provided for sexual contact, it is likely that students considered a range of sexual activities when responding to the sex of sexual contact question,⁵ and students' infection risk will differ depending on the type of sexual contact they experience.¹⁵ Lastly, data are based on self-report, and although YRBS questions have demonstrated good test-retest reliability,⁸ the extent to which behaviors were over- or under- reported is not known.

Conclusions

This study demonstrates that MSM public high school students in Hawai'i are at increased risk for risk behaviors associated with new HIV and HCV infections. Interventions are needed to directly address substance use, suicide ideation, inadequate social supports, and sexual risk behaviors in this population. However, key opportunities and vulnerable populations may be missed if screenings and interventions only target youth by sexual identity, due to substantial discordance between sexual identity and sex of sexual contacts. The expansion of preventive health and harm reduction services to all youth may benefit this population.

Conflict of Interest

None of the authors identify any conflict of interest.

Authors' Affiliations:

- Surveillance, Evaluation, and Epidemiology Office, Chronic Disease Prevention and Health Promotion Division, Hawai'i State Department of Health, Honolulu, HI (JRH, RRS)
- School-based Surveillance Branch, Division of Adolescent and School Health, National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention, The Centers for Disease Control and Prevention, Atlanta, GA (HBC)
- Harm Reduction Services Branch, Communicable Disease and Public Health Nursing Division, Hawai'i State Department of Health, Honolulu, HI (TP)
- Epidemiology and Surveillance Branch, Division of Viral Hepatitis, National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention, The Centers for Disease Control and Prevention, Atlanta, GA (AKA)

Correspondence to:

Joshua R. Holmes MPH; Surveillance, Evaluation, and Epidemiology Office, Chronic Disease Prevention and Health Promotion Division, Hawai'i State Department of Health, 1250 Punchbowl Street, #214, Honolulu, HI 96813; Email: jrholmes@hawaii.edu

References

1. Suryaprasad AG, White JZ, Xu F, et al. Emerging epidemic of hepatitis C virus infections among young nonurban persons who inject drugs in the United States, 2006-2012. *Clin Infect Dis*. 2014;59(10):1411-9.
2. Centers for Disease Control and Prevention. Estimated HIV incidence among adults and adolescents in the United States, 2007-2010. HIV Surveillance Supplemental Report. 2012;17(No.4).
3. Urbanus AT, van de Laar TJ, Stolte IG, Schinkel J, Heijman T, Coutinho RA, et al. Hepatitis C virus infection among HIV-infected men who have sex with men: an expanding epidemic. *AIDS*. 2009;23(12):F1-F7.
4. Turner SS, Gianella S, Yip MJ, et al. Shedding of hepatitis C virus in semen of human immunodeficiency virus-infected men. *Open Forum Infect Dis*. 2016 (Vol. 3, No. 2, p. ofw057). Oxford University Press.
5. Kann L, Olsen EO, McManus T, et al. Sexual Identity, Sex of Sexual Contacts, and Health-Related Behaviors Among Students in Grades 9-12 – United States and Selected Sites, 2015. *MMWR Morb Mortal Wkly Rep*. 2016;65(No. SS-9):1-202.
6. Salek T, Katz A, Lenze S, et al. Seroprevalence of HCV and HIV infection among clients of the nation's longest-standing statewide syringe exchange program: A cross-sectional study of Community Health Outreach Work to Prevent AIDS (CHOW). *Int J Drug Policy*. 2017;48:34-43.
7. Hawaii State Department of Health. 2015 Hawaii HIV/AIDS Integrated Epidemiologic Profile. Hawaii State Department of Health, Honolulu, Hawaii. Published November 2017. Available at: <https://health.hawaii.gov/harmreduction/files/2013/05/2015-Epi-Profile.pdf>. Accessed May 18, 2018.
8. Centers for Disease Control and Prevention. Methodology of the Youth Risk Behavior Surveillance System-2013. *MMWR Morb Mortal Wkly Rep*. 2013;62(No. RR-1).
9. Hawaii Health Data Warehouse. Hawaii Health Data Warehouse Race-Ethnicity Documentation. 2011:14. Available at: <http://www.hhdw.org/wp-content/uploads/HHDW-Race-Ethnicity-Documentation-Report.pdf>. Accessed May 18, 2018.
10. Compton WM, Jones CM, Baldin GT. Relationship between nonmedical prescription-opioid use and heroin use. *N Engl J Med*. 2016;374:154-163.
11. Goldbach JT, Tanner-Smith EE, Bagwell M, Dunlap S. Minority stress and substance use in sexual minority adolescents: a meta-analysis. *Prev Sci*. 2014;15(3):350-63.
12. National Center for Education Statistics. Trends in High School Dropout and Completion Rates in the United States: 1972-2012. <https://nces.ed.gov/pubs2015/2015015.pdf>. Accessed July 19, 2018.
13. National Center for Education Statistics. Estimated total and school-age resident populations, by state: Selected years, 1970 through 2014. https://nces.ed.gov/programs/digest/d15/tables/dt15_101.40.asp. Accessed July 19, 2018.
14. National Center for Education Statistics. Private elementary and secondary schools, enrollment, teachers, and high school graduates, by state: Selected years, 2003 through 2013. https://nces.ed.gov/programs/digest/d15/tables/dt15_205.80.asp. Accessed July 19, 2018.
15. Patel P, Borkowf CB, Brooks JT, et al. Estimating per-act HIV transmission risk: a systematic review. *AIDS*. 2014;28(10):1509-19.